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Cost Analysis of Dental Services

at Wilford Hall Medical Center

**A Graduate Management Project Submitted for
The Degree of Master in Health Administration**

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Disclaimer

The conclusions presented in this manuscript are the opinion of the researcher and do not reflect the judgments of the Army, Air Force, or the Department of Defense. Additionally, this study is exempt from Army Institutional Review Board requirements as per AR 40-38, Appendix B, paragraph B-3, Educational Methods (Appendix H). Further, subsequent publication of the findings of this research or its likeness beyond fulfillment of degree requirements will necessitate prior approval of the Air Force Senior MSC Council and appropriate Service public affairs offices.

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Abstract

The purpose of the project was to construct a model to conduct true cost analysis for services at Wilford Hall Medical Center. Various accounting methodologies were evaluated to determine the best method based on performance and available data. A generic model for evaluating the true cost of providing a service was created using activity based costing techniques. The model was then used to calculate the cost of providing primary dental services at the Kelly Dental Clinic, one of the four dental clinics at Wilford Hall. The total cost of providing primary dental care services at the Kelly Clinic for FY 2003 was \$2,255,374.23, or \$105.71 per Dental Weighted Value (DWV).

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Dental Services Cost Analysis at Wilford Hall Medical Center

Introduction

There is a defined need to provide dental services to the beneficiary population of Wilford Hall Medical Center. Furthermore, there is a requirement to supply trained dentists to the Air Force. The provision of services and training is the dual mission of the dental services at Wilford Hall. However, the true cost of providing these services is not currently known.

The importance of understanding the sources and magnitude of costs is straightforward-when the need arrives to justify expenditures or to determine cost efficiency, an understanding of the true cost is required. Furthermore, as the military moves towards regional health services under the newer generation of TRICARE contracts, consolidating cost efficient services will become increasingly important. Additionally, the decisions as to which services are offered "in house" with limited resources and which will be contracted out will similarly be increasing in importance.

However, calculating the true cost of services is not straightforward. Within the military's Medical Expense and Performance Reporting System (MEPRS), there are a number of programmatic assumptions that do not serve a true cost analysis. While MEPRS is adept at comparing one service to another within the military, it does not represent the true cost of providing that service (Goodman 1999). Therefore, to determine the true cost of a service, a more academic cost-accounting methodology must be employed. Additionally, the MEPRS overhead costs are aggregated at a high level, and are not distributed down to the service level. As an example, the aggregate pharmacy costs are distributed to one consolidated MEPRS account which may contain many service elements.

Furthermore, if a model were developed that could easily accomplish a true cost analysis at the service level it would have greater applicability outside of dental services. In theory, such

a model could be used to analyze the true cost of providing any service, not just dental services. The benefit of such a tool in a cost constrained competitive environment cannot be overstated. However, the model must be validated using real information. It is the goal of this project to develop a general cost analysis model using sound accounting techniques, and apply that model to dental services at Wilford Hall for validation.

Conditions Which Prompted the Study

The cost analysis of dental services at Wilford Hall Medical Center was last accomplished in fiscal year 2001. Recently, budgets to support the provision of medical care within the Air Force Medical Services have tightened. Furthermore, new managed care models have been employed for the Armed Services. Of particular importance is the introduction of the TRICARE multi-market management initiative. While this new initiative does not have any direct impact on dental services, it is a large force on the horizon affecting how the military medical service will do business in the future. Although the application of the model will not have to deal with these factors initially, it is prudent to keep new initiatives in mind when creating the model to ensure the widest applicability possible.

In this initiative, services and funds for the greater San Antonio region will be centrally managed, and baseline funding will be dependent upon enrollment. If a beneficiary seeks care at facility where they are not enrolled, then payment will flow from the facility where they are enrolled to the facility where care was rendered. The implication of this policy is the following: military members enrolled to TRICARE but seen at Wilford Hall will drive a payment from TRICARE to Wilford Hall. Similarly, a patient enrolled to Wilford Hall who receives care from the TRICARE network will drive a transfer of funds from Wilford Hall to the TRICARE contractor. This situation also holds for between-service care. The dollars at risk are unknown at this time. The exact implementation and final methods for determining workload at the

various locations are not yet known. The multi-market analysis for San Antonio is not yet complete. However, there are steps that facilities can take in the interim to reduce the impact of this new policy.

Under this new operational paradigm, cost control, and identification of product lines that are cost drivers is key to programmatic success for Medical Treatment Facilities (MTFs). Understanding the true costs associated with operation of each treatment product line is critical to success. One product line requiring analysis is dental services.

To complete this analysis, cost data will be gathered using MEPRS or through other military data systems such as the Defense Medical Logistics Support System (DMLSS). If data is unavailable from these systems a random sample methodology will be employed to determine costs. The Dental Data System (DDS) will be used to calculate workload/output. The data will be collected and categorized based on the service provided. The focus of the project will be on the Kelly Dental Clinic (one of the four separate dental clinics at Wilford Hall). The reason behind this focus is that only one service is offered at the Kelly Dental Clinic: primary dental treatment. The other dental clinics have a multitude of services making cost differentiation difficult. A corresponding benefit analysis will not be conducted as it lies beyond the scope of this project.

Problem Statement

Determine the costs of dental services at Wilford Hall Medical Center, specifically, the cost of providing primary dental care at the Kelly Dental Clinic. Ideally, the model developed to complete this analysis will have broader application to other services and product lines. In other words, a general model will be developed and the validation of the model will be accomplished using dental services at the Kelly Dental Clinic at Wilford Hall.

Literature Review

General

There are numerous methodologies for cost accounting. There are two broad categories of accounting- financial accounting and managerial accounting. Financial accounting primarily deals with overall firm performance and statutory reporting requirements. Managerial accounting is more focused on decision support. The four primary methodologies within managerial accounting are traditional costing methodologies (TCM), activity based costing (ABC), direct costing (DC), and theory of constraints (TOC) (Boyd and Cox, 2002). TCM divide costs into direct material, direct labor, and overhead costs; overhead is then distributed to products based on a proportion of labor hours used to make the product. ABC systems are similar to TCM methods, but costs are aggregated differently and overhead is applied differently. In an ABC system, costs are aggregated into cost pools then allocated based on usage factors for each pool based on how they are utilized in activities (Ingram, 2003). Overhead is collected and distributed using a similar pooling process. This is roughly the methodology employed by the MEPRS and Expense Accounting System version four (EAS IV). Direct costing excludes fixed costs and overhead, instead focusing on the variable costs associated with producing the product. TOC methodologies are not true accounting methodologies because they do not use the double entry accounting standard, instead using throughput (selling price- material cost), inventory, and operating expense (Boyd and Cox, 2002).

The foundations for these models, with the exception of the TOC model, are detailed in the vast majority of managerial accounting texts. The basics for a solid cost accounting system are laid out in Managerial Accounting (Ingram, 2003). The specific model created must be an amalgam of these accepted principles and the information from the available systems the military uses to track expenditures, manpower, and other relevant costs. However, before settling on cost accounting as the method of choice, it is important to study alternate methods.

MEPRS

In the study of the problem, it is important to understand the current cost accounting methodology employed by the military to calculate an approximate true cost (Department of Defense, 2000). The MEPRS system was developed to track expenses in a manner reflective of ABC methodologies. Each work center is defined as a cost center. Any expense generated by the cost center is pooled. The nature of these expenses is usually manpower, supplies, and equipment. As an example, the housekeeping cost pool consists of personnel costs related to contracted personnel, the cost of supplies, and equipment required for performing the housekeeping function. These costs pools are then allocated to the various sections that use housekeeping services (the vast majority of functions within a facility) based on some sort of workload or usage factor (square footage in the case of housekeeping services). This process is called "purification" and is accomplished using the EAS IV system (department of Defense, 2000). The rules for purification are set by the Department of Defense to maintain a standard methodology for the services.

Through cost pool purification the costs of the ancillary support and overhead functions are "stepped down" to the other cost centers (Department of Defense, 2000). As an example, housekeeping costs are stepped down to all dental and medical services, radiology, pharmacy, lab, etc. Then the lab, pharmacy, and radiology costs are stepped down to the final receiving cost center, where actual patient service was rendered (Department of Defense, 2000). Therefore, the MEPRS true cost includes the direct personnel, equipment, and supply expense for the cost center as well as allocated costs from other cost centers whose services were used. In this manner all costs generated within the facility are allocated to using services (Department of Defense, 2000). The implication is that services receive a portion of many other cost centers that are out of its control; the facilities cost that are allocated to pharmacy are at least partially

purified down to other services since pharmacy is not involved with direct patient care. The exact effect of these inaccuracies cannot be traced or calculated without completely rebuilding the cost accounting system and its methodologies (M. Modzelesky, personal communication, 12 Feb 2004). Furthermore, such a change would require that all the services approve of the methodology and then a contractor must incorporate a software change at a significant cost to the government.

Additionally, the MEPRS data is captured at various levels of detail. In some cases cost centers may be set up along service lines, such as individual clinics (M. Modzelesky, personal communication, 12 Feb 2004). In other cases, the cost centers may incorporate entire squadrons, with many clinics and functions captured by the cost pool. Since the data may be collected at the cost pool level, there is no way to trace the origin of the cost through the system (M. Modzelesky, personal communication, 12 Feb 2004). This problem is the main factor in inaccuracies regarding calculation of service level costs. It is possible to set the cost center codes within MEPRS to fall along service level lines, but the manpower, time, and effort required for a facility the size of Wilford Hall would be enormous.

Economic Efficiency Factor

The method of developing an Economic Efficiency Factor (EEF) to compare dental facilities within the Army was employed in 1999 (Goodman, 1999). The premise of this method was to develop a way to compare dental services at facilities within the Army to determine business process efficiency, and to validate staffing ratio models (Goodman, 1999). The calculation of the EEF was completed by measuring costs avoided by total cost of service (Goodman, 1999). This calculation depended on two key drivers- the civilian equivalent cost of care provided by Army dentists and the total MEPRS cost of providing that service.

It should be noted that this methodology works well for comparing military facility to

military facility at the aggregate service level, but would not work well for comparing military to civilian facility or even comparing service to service at a given facility due to the errors introduced during MEPRS cost allocation. Due to reliance on derived MEPRS costs, the EEF should not be used to conduct a true cost analysis. Furthermore, since no comparison to other services is being made in this study, the EEF does not provide any relevant use. However, in future studies, computing the EEF using the true cost as determined by the model developed in this study should allow efficiency comparisons to civilian services.

Return on Investment

Another method developed to analyze cost data is the Return on Investment (ROI) model. This methodology is used to determine the approximate relationship between costs and outcomes (Blake, 2000). This methodology has a high history of application in the education services where output cannot be directly measured in terms of dollars. In the military, it is similarly difficult to determine the true value of production, as it usually takes the form of cost avoided. Therefore, the immediate market often determines the relative value of services because the cost avoided is dependent on the cost of locally available services. Furthermore, services can have different values based on regional price differences. This regional difference will be critical in making sound decisions based on local markets as dictated by the new TRICARE contracts. However, few government studies incorporate regional differences, as they seek to measure against a standard cost. A true cost analysis should be able to factor in these regional differences. It should be noted that dental services do, in fact, have relatively standardized costs because of a standardized insurance payment model. This insurance model, coupled to the American Dental Association (ADA) standardized coding procedures has led to a relatively standardized price for services.

However, this standard price for services remains only half of the question as the cost of

providing the service must be calculated. Therefore, ROI as a methodology for completing the analysis is not sufficient. ROI is one of the most useful of the cost-benefit methodologies, but this will not be a cost-benefit type of model. Cost-benefit analysis will be aided by the development of a true cost model. Therefore, ROI should be considered in the model development to ensure that any model developed can be used to complete a future cost-benefit analysis.

Cost Accounting Method

The remaining option is to return to the very basics of cost accounting to construct a cost accounting model. However, returning to basics leaves some considerations to be addressed. First, the exact methodology for the cost accounting should be determined; either a financial accounting method, or a managerial method such as the traditional costing method, activity based accounting, or theory of constraints method can be used. In order to understand the importance of the accounting methodology employed, a brief review of accounting practices should be completed.

The purpose of accounting is two-fold. First, the accounting information should be used to support business decisions (Allen, 1997). Secondly, the accounting information should inform stakeholders and individuals external to the firm of the health of the firm (Allen 1997). Over time, these two purposes caused the development of two different forms of accounting: managerial accounting for decision-making, and financial accounting for reporting purposes (Allen, 1997).

As Miller notes, the Financial Accounting Standards Board (FASB) was established in 1973 as an independent, private-sector organization to develop accounting standards and is the agency responsible for financial accounting standards in the United States (1991). It is important to note that MEPRS was developed to meet at least some of the requirements outlined by the

FASB (Department of Defense, 2000). Historically, the gap between financial and managerial accounting methods has grown. The development of agencies like FASB and its predecessors spring from the great depression (Miller, 1991) and corporate frauds such as those practiced by Enron, WorldCom, and others (Longnecker, 2004). The Sarbanes-Oxley Act is widening the current division between financial and managerial accounting (Longnecker, 2004). The consequence of the widening the gap between financial and managerial accounting is that financial accounting data is increasingly confusing for non-professionals, and does not seem to produce monitoring information which can play a really valuable role in corporate management (Allen, 1997).

In reviewing the effectiveness of FASB rules, some trends are revealed. First, the FASB rules have grown more technically complex over time (Derieux, 2000). As the rules become more technically complex, there is a loss of comparability among like firms and a decrease in consistency in reporting (Derieux, 2000). Furthermore, with increasing complexity comes a greater opportunity for manipulation (2000). Second, the effects of globalization are forcing a reassessment of the FASB rules (2000). Because the FASB rules have morphed over time, the end effect is that they have been driven to protect only the present shareholders (Allen, 1997). With many multi-national conglomerates, the wide variety of accounting rules leads to confusion and inaccuracy. Although the technical requirement for financial accounting determined by the FASB remains for Federal Agencies due to Congressional Law and Office of Management and Budget guidance, it is increasingly clear that such a method does not support business decision-making.

Similar to the evolution of financial accounting, managerial accounting has likewise seen development over time. However, the impetus for the changes in managerial accounting is very different. The need for managerial accounting is outlined in Kaplan and Johnson's book,

Relevance Lost, as they demonstrate how the emphasis on statutory financial reporting requirements like the FASB rules has created a system that is both undeniable and unstoppable with no equivalent requirement to provide managers with proper information to operate the business (1986). This observation is confirmed by surveys of chief financial officers: 98% reported cost information is distorted (due to a large degree of emphasis on overhead allocation) and only 23% of respondents were satisfied with decision support information (Sharman, 2003).

With such a low degree of satisfaction with the financial accounting methods, new managerial methods have been developed. The issue for firms is one of survival: making better decisions faster is the norm in global competition. Traditional accounting methods were successful because manufacturing processes in the past were relatively simple, and firms had a relatively homogeneous product mix (Ingram, 2003). However, as businesses evolved over time, and financial accounting diverged from managerial accounting, new methods had to be developed (Sharman, 2003).

Traditional Costing Methods (TCM)

TCM methods were developed to track the cost of manufactured items through production in order to effectively determine two criteria: pricing and product mix (Boyd and Cox, 2002). As Ingram details, the development of systems to track and record such costs have been in existence since the industrial age (2003). Traditional costing methods are labeled as such due to their prevalence in business school curriculum and widespread adoption throughout the business world (Sharman, 2003). The main features of traditional costing measures include division of costs into three categories: direct labor, direct material, and overhead (Ingram, 2003). The overhead is applied to each product produced by some standard production factor such as labor hours (2003). This product cost is then used to determine pricing and other managerial decisions (2003).

This method works well as long as direct labor and direct material dominate the sources of costs. However, as the number and type of products produced increases, technological improvements are made, and the prices of labor and material fall, TCM increasingly fails to provide valuable information. The reason for this is that overhead becomes a greater proportion of the cost of an item (Ingram, 2003). The misapplication of overhead will lead to some products being under priced while others are over priced (Ingram, 2003).

The benefit of the traditional accounting approach is that each section can maintain a balance sheet report, and these reports can be incorporated into the overall balance sheet for the firm, speeding the reporting requirements (Allen, 1997). However, this benefit has waned since changes in financial accounting have further complicated the information by changing the way certain liabilities are assessed, such that organization level costs (such as interest on debt) cannot be equitably allocated to each section of the firm (1997). The end result is that section managers have no good financial information to perform work scheduling, process ordering, and material management (Cokins, 1997). With traditional cost systems, managers are denied visibility of the costs along the business process, especially stocking, distribution, and selling costs (1997). It was in an effort to avoid these pitfalls that Direct Costing was developed.

Direct Costing (DC)

Direct costing was developed using the same cost information as TCM, but only used selective information. As Ingram notes, DC methods ignore fixed and overhead, instead focusing on direct variable costs attributable to the item being produced (2003). Direct costing is not used often, and there is a dearth of literature on the subject. At best, it is an alternative to financial and TCM methods for making pricing decisions (Boyd and Cox, 2002). However, it provides negligible ability to predict profitability (2002). This shortfall led to the development of another method of accounting: activity based costing.

Activity Based Costing (ABC)

Robert Kaplan and Thomas Johnson developed ABC in the 1980s when they realized that management accounting had failed to meet organization requirements (Sharman, 2003). ABC was quickly hailed as the new solution to managerial accounting woes. Despite poor adoption success rates many research articles were published on the power and promise of ABC methods (2003). Perhaps Cokins said it best, "ABC is not a replacement...it is a translator between the cost account accumulators... and the end users, who apply cost data in decision making" (p. 39, 2003).

As ABC methods gain prominence in business school texts, it is expected that they will enjoy a more widespread implementation. However, there are many barriers to implementation. First and foremost, ABC requires a restructuring of accounting systems away from the old financial accounting-based methods (Sharman, 2003). Secondly, there is a new terminology to learn (2003). Finally, ABC implementation is difficult to sustain. In a recent survey, it was found that as many as 60% of the organizations in the United States have attempted to implement ABC, but only 20% have sustained it (2003). Furthermore, 80% of organizations still use traditional accounting methods (2003). Sharman assumes that since 60% have tried it, but most have not replaced their old system, there were insufficient reasons to make the change (2003). This assumption is verified by Boyd & Cox when each of the accounting methodologies is analyzed compared with perfect information (2002).

However, it was also shown that ABC methods are superior to DC methods, and as good as a TCM approach (Boyd and Cox, 2002). Additionally, ABC provides better managerial decision information support by showing the relationship among resources, activities, and cost objects while alleviating some of the overhead allocation problems (Yennie, 1999). By focusing on business processes rather than costs, ABC averts the fundamental shortcomings of TCM

(1999). Specifically, ABC: avoids arbitrary allocations, fosters understanding by operational management, focuses on why costs occur, and provides timely and flexible information (1999).

Although Yennie and others claim that ABC displays the root causes of cost, and gives more accurate and reliable cost information, these claims were ultimately proven unsubstantiated for decision making by Boyd and Cox in 2002. However, it should be noted that the cost information provided by an ABC system is more usable than that provided by TCM, so for situations where conversion to a TOC method is impossible, ABC may be the best alternative.

According to Yennie, there are six steps in the modern application of ABC: identify activities, determine how the resources are related to activities, calculate activity costs, identify cost objects, determine how activities are related to cost objects, and calculate cost object costs (1999). The main purpose of this process is to allocate costs to the events and activities that actually caused the costs to be incurred (Ingram, 2003). ABC identifies the work activities that are responsible for costs (Cokins, 1997). As firms adopt ABC methods, there is a behavioral shift that must take place. These behavioral shifts have given rise to the term activity based management (ABM) and are in place at firms like Coca Cola Co. and Allied Signal Corp. (1997). It is important to note that ABC is merely the input to the ABM philosophy, and often organizational restructuring occurs when such a development takes place (Ingram, 2003).

Fundamentally, the methodology to derive the model consists of computing the direct material, direct labor, and allocated overhead costs (Ingram, 2003). The relevant costs must be selected from each of these measures. The costs must then be allocated to each service in a way that accurately accounts for the costs generated by each service. Generally, the method for allocating costs is to select an appropriate cost basis, and allocate based upon the value of that basis. Lastly, these services should be used to determine the cost for each of the clinics.

Current research indicates that management accounting systems fall within complex and

dynamic organizational settings and aid managerial decisions relating to performance evaluation and control (Sharma and Ratnatunga, 1997). Much research has been done of late regarding the benefits of ABC methods. Compton found that many organizations have found performance can best be achieved by implementing ABC systems (1996). Notwithstanding the long term performance benefits of ABC, there are monitoring benefits as well. However, Boyd and Cox warned that there is a danger of managers using ABC information to make management decisions for which ABC information is not relevant (2002).

The developers of the MEPRS and EAS IV systems have followed the tenets of ABC methods very well. In the DoD instruction covering MEPRS, it states that the purpose of MEPRS is to utilize a standardized method and practice to compute and report an approximate full cost for every fixed Military Treatment Facility (MTF), both medical and dental, in accordance with Federal Financial Standards Number 4 (2000). However, when discussing the ability to calculate service-level costs, the MEPRS manager for Wilford Hall, Ms. Modzelesky, noted that MEPRS was not designed to perform such calculations, and cost pools were aggregated such that it may not be possible to trace the actual cost drivers for allocated overhead costs (personal communication, 12 Feb 2004). The purpose of MEPRS is to calculate organizational level costs, not necessarily service-specific costs. However, there may be an instance where MEPRS gives a service level cost by default, such as when only one service is operating in one functional account code. An example of this situation is when there is only one outpatient surgery clinic in the entire MTF. At Wilford Hall, there are over 10 distinct dental services over four separate clinics that are captured under one dental functional account code (dental laboratory is its own functional account code).

Theory of Constraints (TOC)

TOC was developed by Dr. Eliyahu M. Goldratt, and has been gaining support in the

healthcare community (Bree, Burton-Houle, Aron, 2002). Originally developed for manufacturing processes, TOC was first implemented as a problem solving methodology for production possibilities and popularized in the novel The Goal (2002). The Institute for Management Accountants then evaluated accounting methodologies to implement under such a theory of management (Cheney, 1995). At the heart of TOC is the assertion that constraints determine the performance of a system and that any system only contains a few constraints (Gardiner, Blackstone, and Gardiner, 1994). Logically finding and strengthening the constraint would lead to overall system production increases.

During the development and early adoption of TOC in scheduling activities it was discovered that the local cost performance measures used were faulty in actually measuring the performance of the system (Gardiner, et al., 1994). The production scheduling system that TOC makes clear highlights W. E. Deming's system's approach to manufacturing (1994). The production scheduling technique developed by Goldratt using TOC has come to be known as drum-buffer-rope (DBR) (1994). In many articles DBR has proven to be superior to other scheduling systems in terms of efficiency, cost effectiveness, productivity, and many other measures (Lambrecht and Segaert, 1990; Gardiner, 1994; Boyd and Cox, 2002). Due to the shift in focus from local measures to global measures caused by TOC, new performance measures and accounting measures were developed.

At the heart of the issue is that under ABC, DC, and TCM there is an assumption that if each resource's local efficiency is maximized, then the total system will be maximized (Gardiner, et al., 1994). However, this often creates unusable inventory, slowdowns, and lost time that detract from organizational performance. In the healthcare arena, TOC operational performance measurements are throughput (sales minus total variable costs), inventory (all the money invested in things intended to be sold), and operating expense (all the money the system

spends turning inventory into throughput, i.e. wages, utilities, interest payments, etc.) (Breen, et al., 2002). The situation for non-profit organization changes somewhat, but fundamentally the issue at hand remains the same. Basically, the TOC identifies a goal- throughput, and seeks to optimally supply resources to a process that maximizes that goal.

In their work, Boyd and Cox found TOC methods to provide superior cost information for decision making compared to the other cost methodologies over a wide range of cases (2002). However, their conclusions were based on the assumptions of linear production relationships. Medical and dental services rarely exhibit such relationships. Another barrier to using the theory of constraints methodology for this study is the inability to frame current data into the form required by the method. All current data available is in the direct cost (actual cash value) or in the form of a cost pool (MEPRS). Despite the superiority of TOC methods, they are not feasible to apply at the current time. Due to the superiority of ABC methods over direct costs and traditional costing methods, and the availability of cost pool data from MEPRS, the ABC method will be employed (Boyd and Cox, 2002).

Purpose

The central objective of this study is to provide a detailed real cost model of providing a medical service. Furthermore, the model created will be used to calculate the real cost of providing dental services at Wilford Hall. The model will follow proven cost accounting methodology to the maximum extent possible. As such, the study is an analytic evaluation with no hypothesis tested. The variables present represent costs associated with providing services. Generally speaking, these costs are divided into direct material, direct labor, and allocated overhead costs. Within these cost groups, only the relevant costs must be considered. The relevant costs must then be allocated to the applicable dental services at Wilford Hall using an allocation basis. This basis may take the form of an equation (to describe personnel time shared

across multiple services), or be directly attributable (supplies consumed by a service). To accomplish this, existing unallocated MEPRS and Medical Logistics data will be reviewed, and current allocation procedures scrutinized. Following this process, accepted cost accounting procedures will be used to develop the model. Once the model is developed, it will be used to determine the cost of dental services.

Methodology

The methodology employed to develop the model was that of the ABC method outlined earlier. The MEPRS cost report for CAAA (MEPRS code for dental services) was obtained for FY 2003. The actual direct labor was calculated using the DoD standard salary table and the personnel assigned to the Kelly Dental Clinic as listed on the unit manning document for FY 2003. Direct material costs were calculated by obtaining a summary report of all items purchased and delivered to the Kelly Dental Clinic from DMLSS. Additional investment equipment costs were also gathered from the DMLSS system.

The validity of the model is based on the generally accepted accounting methods and the nature of cost accounting. The very purpose of this project is to increase the validity of real cost information for the services provided by the military. By using a more accurate academic approach, it is expected that the resulting cost analysis will be more valid than the current derived MEPRS cost. There are some threats to internal validity if the sampling technique is used, as sampling introduces error. However, this threat is mitigated by the fact that any sampling of true cost data will incorporate a single best estimate of the true cost. Additionally, sampling will be avoided to the maximum extent possible.

The reliability of this study is expected to be high due to the nature of the cost information gathered. In the case of manpower and direct supplies, the actual cost or defined salary cost will be used. In the case of supplies, these amounts are recorded as actual dollar

expenditures, and personnel cost tables are accepted across the DoD as standard. One of the prompts for this study is the lack of reliability in cost measures within the military medical service. The purpose for creating a generic model and validating it using real cost information is to increase the reliability of the derived information. By using a generic model, the ability to apply the model to areas outside of the dental services should be increased, thus increasing the ability to test the model.

The following is an outline of the procedures required to create the model:

1. Determine which costs need to be included in the model as relevant costs.
2. Break costs into direct material, direct labor, and allocated overhead.
3. Determine availability of real cost data (determine when MEPRS costs can be used and when actual or sampled costs will be used instead)
4. Determine allocation basis for costs.
5. Allocate and summarize the costs.

Application and testing of the model will occur as follows:

1. Collect cost data.
2. Divide these costs into direct material, direct labor, and overhead costs
3. Allocate the costs to specific services using the model created.
4. Deriving the total cost of providing the service.

Expected Findings and Utility of Results

The expected findings of this project are limited to a detailed real cost analysis of providing dental services at Wilford Hall for FY 2003. The specific service to be examined will be primary dental services delivered at the Kelly Dental Clinic. This alone is a much needed review of the cost of dental services at Wilford Hall. However, the development of a model to derive these costs should have much wider applicability. By generalizing sound accounting

techniques and applying them to the specific case of a military medical service, this study should increase the ability to compare military services to mixed contract or civilian services.

Furthermore, it will enable more accurate cost efficiency comparisons, return on investment and other cost-benefit analyses, as well as aid other future cost-driven analyses. These results should aid all levels of the healthcare management spectrum from clinic commander to Air Staff.

Specifically, commanders and resource managers can determine which areas of the facility are cost drivers, and what are the key budget factors. Market managers can determine which services should be increased, consolidated, or eliminated. Regional commanders will be better prepared to negotiate contracts with providers. Air Staff will have a standardized procedure for cost comparison and a justification for budgetary allocations.

The study will not include any direct cost controlling recommendations, as the issue remains outside the scope of this project. Furthermore, the study will neither contain a cost-benefit analysis, return on investment, nor any other sort of cost-efficiency analysis. These issues are left for future study once the cost model has been validated and can be demonstrated to have broader applicability in these areas. However, to the maximum extent possible, the model will be constructed with these purposes in mind.

Results

Table 1 Salary Expense for Assigned Manning		
AFSC	Rank/ Grade	Annual Cost
47G4A	COL	\$ 162,496
47G3	CPT	\$ 98,303
4Y072	MSG	\$ 70,809
4Y071	TSG	\$ 62,571
4Y051	SSG	\$ 53,439
4Y051	SRA	\$ 44,332
4Y031	SRA	\$ 44,332
4Y031	A1C	\$ 37,741
4Y031	A1C	\$ 37,741
4Y031	AMN	\$ 36,478
4Y031	AMN	\$ 36,478
Total		\$ 951,915

Table 2
Direct and Allocated Expenses for Dental Services (consolidated), FY 2003

Direct Expense	Stepdown Expense From D accounts	Stepdown Expense From E accounts	DoD SEEC	DoD SEEC Description
511,918.00	133,983.58	544,492.56	11.10	CIVILIAN PERSONNEL COMP
98,676.00	9,896.11	2,892.79	11.71	RESERVES PERSONNEL COMPENSATION
13,468,225.00	807,594.42	3,165,766.11	11.72	MILITARY PERSONNEL COMPENSATION
138,602.00	27,941.67	156.89	11.74	BORROWED MIL LABOR
0	0	0	12.10	CIVILIAN BENEFITS
0	0	0	13.00	FORMER PERSONNEL BENEFITS
23,473.00	3,494.92	29,095.61	21.00	TRAVEL & TRANSPORT OF PERSONS
0	304.19	984.95	22.00	TRANSPORTATION OF THINGS
0	2,174.89	12,706.63	23.05	RENTAL PAYMENTS
0	2,951.67	47,583.96	23.10	COMMUNICATION
0	37,204.11	326,651.65	23.15	PURCHASED UTILITIES
0	1,384.93	4,777.77	24.00	PRINTING & REPRODUCTION
0	3,053.53	29,893.20	25.15	PURCHASE MAINT EQUIPMENT
0	53,965.11	475,469.98	25.25	CUSTODIAL SERVICES
1,564.00	442.36	2,247.66	25.30	EDUCATION & TRAINING
0	77,156.93	655,319.58	25.40	RECURRING REAL PROPERTY MAINT
0	39,901.59	324,820.69	25.45	DESIGN ARCHCTRL & ENG SER
0	271,623.78	659,246.12	25.50	CONTRACT HEALTH CARE
0	1.61	26.71	25.55	COOPERATIVE AND SUPPLEMENTAL CARE
4,000.00	56,359.38	483,500.50	25.65	OTHER MIS CONT
0	8,797.97	68,951.27	26.10	FUELS
1,303,459.00	716,051.62	170,048.20	26.15	MED/DENT SUPPLIES
0	20,167.23	244,493.63	26.20	OTHER SUPPLIES
0	2,408.92	38,554.81	31.10	INFO PROCESSING EQUIP
113,574.00	69,011.84	50,777.69	31.15	MED/DENT EQUIP
0	99,435.17	829,816.27	32.10	CONSTRUCTION/REPAIR PROJECTS
0	71,306.86	968,489.08	41.10	FREE RECEIPTS/UNFUNDDED/NON REIMBURSABLE
0	8.35	141.18	43.00	INTEREST AND DIVIDENDS
15,663,491.00	2,516,622.74	9,136,905.49		

Table 3
Cost Analysis Summary

Description	Cost	Source
1 New Equipment Costs	\$ 8,768.78	DMLSS
2 FY 2003 Purchase Value of Equipment	\$ 431,821.75	DMLSS
3 Total Dental Workload	226,242.94	DDS
4 Kelly Clinic Workload	21,334.62	DDS
5 Kelly Percentage of Total Workload	9.43%	Item 4 / Item 3
6 Total Dental Stepdown Costs	\$ 11,653,528.23	EAS IV
7 Kelly Share	\$ 1,098,923.12	Item 6 * Item 5
8 Depreciation Expense	\$ 43,182.18	Computed
9 Supply Costs	\$ 158,609.88	DMLSS
10 Personnel Costs	\$ 951,915.00	Salary Table
11 Allocated Overhead and Indirect Costs	\$ 1,098,923.12	Item 7
12 Pharmaceuticals	\$ 2,744.06	Pharmacy Database
13 Total costs	\$ 2,255,374.23	
Cost/DWV	\$ 105.71	

Using the available data, a modified ABC method was employed to construct the true cost model. The ABC method was employed because TOC methods were not feasible given the system as is. While TOC would be the superior solution, to attempt an enterprise-wide transition is beyond the scope of this project. However, as a result of this project, the recommendation to pursue TOC methods is made. The MEPRS system and EAS IV combine to form the backbone of the ABC system. The cost center, CAAA is a MEPRS code that identifies a pool of all dental costs incurred and recorded. This pool could not be broken down into member clinics or services; therefore a service level approach was taken to develop the model.

The first step was in identifying a service (product line) to analyze. Dental primary care was selected for analysis because of recent dental care optimization (DCO) initiatives and the consolidation of Wilford Hall medical and dental services with those provided by the Kelly Clinics. This consolidation has the potential to lead to duplication of effort in the primary dental care area. Kelly Dental Clinic was selected because its dental primary care product line was

easily excluded from the dental lab services also provided there, and there were no other services to confound the results.

Next, relevant costs were determined. The three major areas for the costs were personnel, equipment, and overhead. As with most modern organizations, overhead dominated the cost structure of the Kelly Dental Clinic. To determine relevant costs, each of the items in column one of table 2 was evaluated to determine if their source originated in the Kelly Dental Clinic. If there was a positive value in this column, than a direct expense occurred somewhere in the various dental clinics and might be attributable to the Kelly Clinic. Each of the items listed in column one of table 2 was also evaluated to make sure the MEPRS system did not miss any costs incurred (perhaps personnel paid from outside the MTF budget). In this review no additional cost items were discovered.

Next, the relevant costs were grouped into cost pools. The DoD Standard Element of Expense Code (SEEC) listed in table 2 formed the framework for the cost pools. Each of these cost pools was evaluated for the Kelly Dental Clinic. To the maximum extent possible, the direct expense for an item in the pool was used. The reason for this is that the MEPRS direct expense represents the aggregate expense in that pool for all of Dental Services (10 services over 4 clinics). Because this data is collected at a level higher than the clinic, the costs cannot be traced back to the clinic that originated them. Therefore, the direct cost within the cost pools were calculated using information from DMLSS and other sources to capture the cost directly attributable to care at the Kelly Dental Clinic. Ultimately, the direct costs in the pool would be combined with allocated costs in the cost pools to compute the total cost in the pool. These cost pools would then ultimately be assigned to the Kelly Dental Clinic.

Direct labor was calculated using the Unit Manning Document and DoD FY 2003 Salary table (see table 1). Direct material costs were calculated using the summary issue turn-in report

from DMLSS (see appendix B). The total fixed equipment cost was also received from DMLSS. This amount represents purchase cash value for equipment in the Kelly Dental Clinic. For the purpose of analysis, a 10-year straight-line depreciation method was used to calculate the approximate value of equipment used in services over the year. The value of prescriptions written over the year was found using a query of a pharmacy database based on providers from the Kelly Dental Clinic. The sum of these four values represents the total direct costs of primary dental services at Kelly Dental Clinic. There were no additional relevant direct costs (such as training costs) applied to the dental services due to absence of such costs in a review of the records.

Once these direct elements of the cost pools were determined, the allocated or distributed portion would need to be calculated. There is no way to calculate a true overhead rate without utilizing the MEPRS information. The reason for this lies in the complexity of the MEPRS system and interdependency of services at Wilford Hall. However, excluding the overhead from the analysis was not in line with ABC methods. Therefore, a compromise was made. To calculate the applied overhead for Kelley Dental Clinic, the total overhead applied to all dental services from the EAS IV system was used (sum of columns two and three in Table 2). The comparative workload (captured in dental weighted values) of Kelley Dental Clinic to total dental clinic workload was calculated (see appendix C). This relationship became the allocation basis for total dental (MEPRS functional account code CAAA) overhead costs to be applied to Kelly Dental Clinic. The summary of these results can be found in Table 3.

Discussion

General

There is a fundamental advantage to having more accurate cost information. However, there is a cost associated with gaining perfect information for decision-making. The issue at

hand is determining whether shortfalls in the current information are so severe as to warrant an enterprise-wide change in procedures that could cost billions of dollars to make. In the competitive world, such a change may be required for survival, as noted by Rick Honer, "if we hadn't switched over [to TOC] we probably wouldn't be here today" (Cheney, 1995). However, the world of federal healthcare may be drastically different. The cost of the federal healthcare accounting system is virtually unknowable (M. Modzelesky, personal communication, 12 Feb 2004). The benefit of making such a change and actually improving the competitiveness of the federal healthcare system is similarly unknowable. In light of this situation it is unlikely to expect the situation to change with regards to federal healthcare accounting systems in the near future. Therefore, it is increasingly important to understand the shortcomings of the systems so that managers can utilize the information they have in a more productive manner and to make the best decisions possible with imperfect information.

MEPRS utilizes a version of the ABC method in determining the cost of services. However, the cost basis employed in determining these costs is imperfect for true cost of a service because factors outside the service in question can influence the total cost allocated under each of these categories due to the way cost pooling is performed. As an example, if an identical service is compared between two MTFs of different age, there is the potential for a large difference in allocated repair costs, even if the service in question in each was in a clinic building that was new and not the source of repair costs. Likewise, many of the allocated costs assigned to a service are due to factors well outside the service. To realize the full magnitude of this situation, the MEPRS allocated costs to dental services represent 43% of the total cost for dental services. Stated otherwise, 43% of the cost of dental services is allocated from other areas. It should be noted that a vast majority of these costs are personnel costs related to administrative overhead.

Similarly, direct labor costs can appear skewed as well. The skew of labor is a result of the way the manpower costs are collected. MEPRS uses a standardized DoD salary table to determine personnel costs. However, these costs are collected at such a high level, that they are not useful in determining the actual direct labor cost for a service. Allocating the labor costs using a cost basis is not suitable, as the relative cost of individuals can greatly vary based on rank and service provided. However, the same salary table can be used in conjunction with the unit manning document to determine the actual cost of direct labor, and maintain DoD standards. The MEPRS monitor for Wilford Hall recalled a study of the validity of the DoD salary table and recalled it to be a good approximation for the total cost of personnel (M. Modzelesky, personal communication, 12 Feb 2004). Unfortunately, this study was not published, nor were there other records. Goodman reports that "over 83% of the cost of funding for direct dental care is for personnel" (p. 30, 1999). During this project, personnel costs accounted for 70% of the total cost of dental services. This percentage takes into account personnel that are allocated personnel costs which suffer the same problems as other allocated costs outlined earlier.

In order to construct the model, the traditional steps of developing an ABC model were followed. The steps included: determining the cost object or cost center (service that will have costs allocated to it), the activities (actions that generate costs), and indirect cost pools (collection of indirect costs to be allocated to cost centers). In the case of the Kelly Dental Clinic, the cost object is primary dental care; the activities are all those that are used in the provision of care (scheduling, preparation, delivery of care, etc.). These activities are captured in the CAAA cost center. However, also included in this cost center are all the costs associated with the other dental services at Wilford Hall. Therefore, direct costs were calculated individually, only considering relevant costs. The indirect cost pools are all the standard element of expense (SEEC) codes within the MEPRS system and range from communication support to

fuels and education and training (Table 2). Each of the cost pools is evaluated within MEPRS for relevance compared to the cost center. Each relevant SEEC cost is allocated to a cost center based on a workload factor established by the department of defense and listed in the MEPRS instruction (2000).

Ideally, the unallocated cost pool data would be available. However, the cost structure of Wilford Hall is so complex that the current systems could not extract the raw data from the EAS system, as the file size exceeded the capacity of commercially available software packages. Even if this data were available, the step down method of allocation MEPRS uses is too complex to work by other means. Furthermore, the time involved in determining new cost data or allocation basis would be prohibitive to conducting a timely analysis. Therefore, the inaccuracy of the overhead cost pool data is an unavoidable situation until a newer software tool is developed for the Department of Defense. It bears mention that the cost bases within MEPRS follow the guidelines outlined by the Federal Accounting Standards Advisory Board.

The allocation basis for overhead costs chosen was the Dental Weighted Value (DWV). The DWV is a standard system of coding dental cases and establishing payment schedules (DoD 2000). By calculating the true cost of primary care services for Kelly Dental Clinic using the model and determining a cost per DWV, a measure of efficiency and mechanism for comparison is easily established. However, as Boyd and Cox (2002) pointed out, this data may not be the best to determine make vs. buy decisions. In other words, caution should be taken in determining whether MEPRS or other ABC data should be used to determine the most cost effective strategy; whether to provide the service using military, contract, or partial services may be outside the realm of an ABC model such as that employed by MEPRS to determine.

However, there is a way to derive comparisons using other elements of the model. The direct labor and material costs can be used to make direct cost comparisons to other services.

Although these comparisons are similarly suspect in make vs. buy decisions, such comparisons are good for determining the relative cost efficiency of different aspects of a service. For example, the advantage of civilian vs. military vs. contract providers can be determined.

Model Specific

One of the crucial steps in developing the model was the determination of relevant costs (Caplan, 2003). The relevant direct cost drivers for all of dental services are shown in column 1 of table 2. Each of these cost elements was evaluated independently using actual budgetary allocations and interviews with clinic staff to determine if any services were used in the Kelly Dental Clinic. However, if a relevant direct cost was incurred, actual cost data from DMLSS or pharmacy databases were used instead of MEPRS direct cost. The reason for this is that the MEPRS direct costs include direct cost for other clinics and services as well as the Kelly Dental Clinic. By using the actual costs incurred, the allocation problems associated with allocating direct costs to services can be avoided. It was found that the only relevant direct costs were direct personnel, direct equipment, direct supplies, and pharmaceuticals. In other studies, training costs, borrowed labor, travel and transportation, and other direct costs may be included in the relevant cost for services.

After completing the analysis, there are a number of improvements that can be made in future studies. First and foremost, the model must be expanded to include multiple services under the same functional account code. This expansion is particularly difficult in co-located, resource sharing functions, such as a flexible ward, or flexible dental room where multiple providers use the room for varying services. Similar to the model constructed, DMLSS reports can be used to calculate the cost of supplies and equipment, and user surveys designed to determine an estimate of usage would dictate the percentage of supplies or equipment usage (depreciation) to allocate to each service. However, this sort of analysis is limited to a

retrospective review. A better way to approach the problem may be to reorganize the information within the various data systems like DMLSS and MEPRS along service lines. It should be noted that this approach might be overly time-consuming for large organizations such as Wilford Hall.

The second major improvement should come in calculating the economic costs of using supplies and equipment. The estimate for depreciation in the model was crude at best. The ten-year straight-line method was based on various conversations regarding the average time until replacement for dental equipment (hand pieces are considered supplies). There is currently no mechanism in any of the logistics systems to determine depreciation, let alone allocate it properly. Within MEPRS, the equipment in a section is not depreciated; it is allocated as an expense. Essentially, dental equipment is not depreciated because all the depreciation goes to the same cost center. However, equipment that is shared by multiple functional cost codes is depreciated, and each section gets a share based on reported workload (M. Modzelesky, personal communication, 12 Feb 2004).

From this research it was found that the MEPRS and DMLSS systems are surprisingly robust. However, implementing a truly accurate cost accounting system with the tools at hand would be extremely time-consuming. Secondly, the individuals who would have to do the work would likely not see any benefit from accomplishing the monumental task. Thus, the age old quandary of the cost of perfect information comes into effect. It is left to the decision maker to evaluate if the current protocols offer accurate enough accounting information to make sound decisions. At the time of this writing, it appears that increasing economic pressures from the new Tricare contracts and other events are increasing the value of accurate cost information, though to what extent the value is increasing is uncertain.

Overall System Improvements

The problems addressed in the appraisal of MEPRS's ability to allocate indirect costs are not new. In fact, the General Accounting Office (GAO) noted in 2003 that, "The Department of Defense faces financial and related management problems that are pervasive, complex, long-standing, and deeply rooted in virtually all business operations throughout the department. These problems have impeded the department's ability to provide complete, reliable, and timely business information" (GAO, p.1). The report goes on to investigate the volume of expenditures spent to improve the systems and whether improvements are effective. There are numerous instances that were discovered while working on this project that validate the GAO's findings. For example, the budget expenditures did not always match what the base contracting office had as paid (so the true cost of contracted services can be questioned); the logistics system sometimes produced incongruous information due to period expenses and inventories; and systems were not flexible in providing necessary information.

Second, the continued employment of an ABC based accounting system is in question. Perhaps future systems can incorporate the TOC model. Since the DoD is not a profit-making firm, the decisions made are usually managerial in nature. Adopting a TOC model would aid Congressional lawmakers as well as DoD Managers. As more research is completed on the effectiveness of ABC systems, there is increasing agreement that ABC is not much more than a traditional accounting method with a new look (Boyd and Cox, 2002).

It should be noted that compared to some other DoD systems, the medical cost accounting network of systems is fairly well integrated. However, each is greatly prone to problems with data quality. In many cases, the issue is one of currency. Many of the automated computations established in MEPRS are grossly inaccurate. The reason for this is the number of different systems that require update in order to accurately enter cost data into MEPRS. An example of the difficulty in maintaining updated information is in personnel costs. Because

MEPRS relies on staffing inputs from other systems, when the facility acts differently than what manpower systems have recorded (such as anticipation of future changes, or pending a mission change) its cost data can become inaccurate. MEPRS does not sufficiently capture temporary or unplanned personnel actions (such as local reorganizations, deviations from manpower models, etc.) sufficiently.

Last, the major issue at hand is how the information will be used. MEPRS was not designed to be a system to compare military to civilian care on a cost or service-level basis. It is not uncommon for a civilian contractor to charge the military at its variable cost and ignore fixed costs when developing the charge schedule (similar to accepting Medicare rates). However, when the cost of service is computed by the military, fixed overhead costs are applied. Additionally, military-specific non-relevant costs are not excluded. A certain percentage of manpower expenditures are related to military unique costs: court martial duty, physical fitness testing, military training, etc. that are not part of service delivery. The time spent in these endeavors should be removed from the analysis. There was no published guidance and through many discussions no plausible solutions were found to account for these costs.

Central Management Issues

The central management issues are three fold. The first issue is one of competitiveness. The second issue is one of accountability. The third is one of education. Each of these issues will be addressed in turn. In order to understand the framework these issues will be addressed in it is important to recall why cost accounting and managerial accounting emerged as disciplines in the first place: to support management decisions. Ultimately, these decisions lead to the success or failure of an organization. If the information used to make these decisions is significantly flawed so as to prevent sound decisions then new methods must be sought. However, if the worst the information does is provide a myopic view of the financial landscape, then perhaps

there is an education that can be made to adjust for the deficiency. Ultimately, only time will tell if the faults with the information are blinding, or correctable through education.

The first major managerial issue is one of competitiveness. Although this study focused on one service at one clinic among many, it highlights the basic situation of the military medical service. Currently, the military is competing with contractors to provide care at the lowest cost to the taxpayer while maintaining quality, and access. Without good cost information, it becomes unclear as to what services are revenue-earning operations and which operations are revenue users. In the terms of TOC, the constraints need to be identified. In the long view, the Defense Health System (DHS) competes for funding with Medicare and other federal services. The deployment requirements for the military only justify a certain number of soldier-medics. Furthermore, changing operational paradigms may further reduce the footprint of the DHS. The current operational environment is one of synergy between the Tricare contractors and the DHS. It may not be long before this changes to an idea of managed competition between DoD services and contractor vying to provide services. If the DHS hopes to survive as an entity it must control costs better. In order to control costs, it must understand the nature of current cost information and determine if an ABC method is in its best interest.

The second major issue is one of accountability. The Congress and the American people ultimately demand that the DHS be good stewards of tax dollars. To understand how tax dollars are being utilized for the public good is not an option. In an era of increasing corporate irresponsibility, it is not unlikely that Congress will expect the same level of accountability with its own federal members. In order to hold members accountable for their actions, managers must be able to understand the actions taken, and their overall effect on the system. Current programmatic shifts may prove to be shortsighted and unnecessarily costly. The only way to determine for sure is to have valid data to support the decisions. If the decisions cannot be

supported with sound data, they cannot be justified. Without really understanding the data, managers cannot really make informed decisions. If managers are not making informed decisions, and they are not being held accountable, this is also an issue.

Education is the final managerial issue to be addressed. It is well known that decisions are made with imperfect information. It was not uncommon over the course of this project to hear that managers use the best data they have. However, it was not often heard how managers were adjusting their actions to neutralize the deficiencies in the data. The purpose of the model is to allow managers to understand the sources of expenses better than previously possible. Additionally, it is to provide a method for developing a better understanding of the cost accounting system employed by the Military Health System (MHS). This education must take place if decision makers are going to overcome the known deficiencies and inadequacies in the systems and the methods utilized in determining the cost for services.

Conclusions and Recommendations

The situation regarding developing a true cost to provide a service reduces to a simple assessment. The principal question at hand has to do with an assessment of need. There must be a determination of what level of accuracy is required to make financial based decisions. It has been shown in the literature that the ABC method is inferior to the TOC method on all accounts, and is capable of providing optimal financial support for decision-making only 60% of the time (Boyd and Cox, 2002). Currently, Congress has accepted the level of inaccuracy within the MEPRS system by proxy of the Federal Accounting Standards Advisory Board guidelines. However, while this information may be suitable to compare costs among services (since all suffer the same detriment), this standard may be insufficient to make sound financial decisions for purchased care.

If the assessment is made that there is not a need to completely abandon the ABC

methodology for managerial support, then implementing the methods outlined in this report are sufficient to improve the accuracy of service-level cost information. However, this data should not be used in a make vs. buy analysis since it incorporates allocated costs. Furthermore, MEPRS data should not be used to calculate a cost per DRG, CPT, or other code set since the allocated costs will skew the results significantly. If the need assessment reveals a need for better financial information for managerial decision support, the ABC method should be abandoned in favor of the TOC methodology.

Given the nature of the problem, there were a number of methodologies for approaching the development of a model to calculate the true cost of providing a medical service. It was shown that an activity based costing model best fit available data and had the highest capacity for providing sound managerial decisions. Furthermore, it was shown that the direct costs of providing a service could be calculated without using MEPRS data. However, it is not possible to calculate allocated overhead without substantial reliance on MEPRS data. This reliance introduces error into the cost data.

The model created uses actual expenditures to determine direct costs for equipment, supplies, and pharmaceuticals from the DMLSS and pharmacy systems. Direct labor costs are calculated using the actual personnel assigned and the DoD salary table. Overhead is allocated to the service based on workload (DWVs). These costs are then used to construct the true cost analysis. This methodology is expandable to other services within Wilford Hall. However, some expansion of the model may be required for more complex, integrated services.

Future studies should expand the model to handle multiple services within the same functional account code. In order to complete this task, more accurate accounting for the location, usage, and availability of supplies and equipment needs to take place within the DMLSS system. Any effort in this process will also pay dividends in other areas as well:

limiting lost equipment, speeding equipment inventory and servicing, increasing order efficiency, as well as others. Additionally, the MEPRS functional account codes should be set up with sub accounts for services wherever possible. This will aid in allocating overhead to the service center. So long as an accurate workload measure is available and is common between sub-accounts there should be no problem in allocating overhead. However, there will be difficulties in allocating direct supply and equipment costs. The easiest way to calculate these costs is by surveying the sections to determine supply usage.

It should be noted that all recommended actions are within the scope of current responsibility. This is not to say that any section is derelict, but rather each faces the ongoing challenges from mission changes as indicated by Manning and Planning Programming Guidance (MAPPG), primary care and dental care optimization, increasing readiness requirements, and the myriad of other factors that put the state of the MTF in constant flux. To improve the accuracy of the cost data is an ongoing task, and there will continue to be a fight with data quality. Therefore, the requirement will be on managers to understand the shortfalls of available data. As noted by Briers, Luckett, and Chow, "decision makers display an inability to look behind the labels attached to accounting numbers in order to judge the appropriateness of the information for a given decision" (1997, p.1). However, when they are capable of looking past the labels and adjusting to the inadequacies of the data, sound decisions can still be made (Dearman and Shields, 2001).

Some key observations from the research indicate that the cost data in MEPRS may be inaccurate for cost comparisons and make vs. buy decisions. Therefore, to compare services, other methods will need to be developed. One alternative is to compare marginal cost of civilian contracted services (contract cost) to marginal cost of military facilities. In this way, the fixed cost of the infrastructure and depreciation are considered a sunk cost, and thus irrelevant to the

decision. The model, as constructed, is capable of determining a true marginal cost of services by eliminating MEPRS allocated overhead and depreciation from the calculation. However, as Boyd and Cox point out, this direct cost technique is also prone to some errors (2002).

Therefore, the single best course of action is to convert to another system of managerial accounting, such as theory of constraints, which will better inform the decision maker. The issue surrounding this change is whether the cost of making such a fundamental change is even close to the perceived benefit from improvement in cost data. The situation may be that the cost data, as is, is sufficient for decision makers. On the other hand, it may be that lawmakers are only concerned with statutory reporting requirements for their constituents. Current federal accounting standards and practices suggest that the current standard is sufficiently accurate to constitute an approximation of true cost (Department of Defense, 2000). Thus, such a change would be an improvement to something greater than that required by law. It is unclear whether the funding exists to implement what must appear to some to be an unnecessary change.

With these factors in mind, the model presented represents the best use of current data to escape some of the problems associated with MEPRS cost allocation. Furthermore, the model can be expanded to calculate the true cost of other services. The model remains hindered by the quality of MEPRS allocated costs, and the inherent limitations of the ABC methodology. However, this hindrance is tempered by the cost of more perfect information. Increasing the reliability of MEPRS data beyond the current system parameters would be cost prohibitive. Furthermore, reliability can be increased by slight programmatic changes within the MEPRS and DMLSS systems. These improvements and changes are ongoing, as refinement of both systems continues. Continued efforts in data quality and system integration will only improve the ability of managers to understand the true cost of providing services to the beneficiary of Wilford Hall Medical Center.

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Appendix A

Raw MEPRS output

Report Title	Direct Expense	Stepdown Expense From D accounts	Stepdown Expense From E accounts	DoD SEEC	DoD SEEC Description
	511,918.00	133,983.58	544,492.56	11.1	CIVILIAN PERSONNEL COMP
98,676.00		9,896.11	2,892.79	11.71	RESERVES PERSONNEL COMPENSATION
13,468,225.00		807,594.42	3,165,766.11	11.72	MILITARY PERSONNEL COMPENSATION
138,602.00		27,941.67	156.89	11.74	BORROWED MIL LABOR
0	0	0	0	12.1	CIVILIAN BENEFITS
0	0	0	0	13	FORMER PERSONNEL BENEFITS
23,473.00		3,494.92	29,095.61	21	TRAVEL & TRANSPORT OF PERSONS
0	0	304.19	984.95	22	TRANSPORTATION OF THINGS
0	0	2,174.89	12,706.63	23.05	RENTAL PAYMENTS
0	0	2,951.67	47,583.96	23.1	COMMUNICATION
0	0	37,204.11	326,651.65	23.15	PURCHASED UTILITIES
0	0	1,384.93	4,777.77	24	PRINTING & REPRODUCTION
0	0	3,053.53	29,893.20	25.15	PURCHASE MAINT EQUIPMENT
0	0	53,965.11	475,469.98	25.25	CUSTODIAL SERVICES
1,564.00		442.36	2,247.66	25.3	EDUCATION & TRAINING
0	0	77,156.93	655,319.58	25.4	RECURRING REAL PROPERTY MAINT
0	0	39,901.59	324,820.69	25.45	DESIGN ARCHITCTRL & ENG SER
0	0	271,623.78	659,246.12	25.5	CONTRACT HEALTH CARE
0	0	1,61	26.71	25.55	COOPERATIVE AND SUPPLEMENTAL CARE
4,000.00		56,359.38	483,500.50	25.65	OTHER MIS CONT
0	0	8,797.97	68,951.27	26.1	FUELS
1,303,459.00		716,051.62	170,048.20	26.15	MED/DENT SUPPLIES
0	0	20,167.23	244,493.63	26.2	OTHER SUPPLIES
0	0	2,408.92	38,554.81	31.1	INFO PROCESSING EQUIP
113,574.00		69,011.84	50,777.69	31.15	MED/DENT EQUIP
0	0	99,435.17	829,816.27	32.1	CONSTRUCTION/REPAIR PROJECTS
0	0	71,306.86	968,489.08	41.1	FREE RECEIPTS/UNFUNDDED/NON REIMBURSABLE
0	0	8.35	141.18	43	INTEREST AND DIVIDENDS

P780	PARA POST XP KIT	1/1/2003 00:00:00 R	1C551131531335	1 KT	116.51	3626 BRS	5.65
PCP15/11.5	PROBE-DIAGNOSTIC	1/1/2003 00:00:00 R	1C551123161924	20 EA	11.75	3626 BRS	11.4
PIC369	PROBE AND IRRIGATION C PIC 3-6	1/1/2003 00:00:00 R	1C551123051902	3 BX	130.79	3626 BRS	19.03
PIC369	PROBE AND IRRIGATION C PIC 3-6	1/1/2003 00:00:00 R	1C551130070957	4 BX	130.73	3626 BRS	25.36
R40-05-60	XCP INDICATOR ARMRING	1/1/2003 00:00:00 R	1C551130422280	15 EA	21.9	3626 BRS	15.93
R40-06-07	AIMING RINGS ANT. BITE WING	1/1/2003 00:00:00 R	1C551130422282	15 EA	4.95	3626 BRS	3.6
R40-06-68	INDICATOR ARM RINGS POSTERIOR	1/1/2003 00:00:00 R	1C551130422281	15 EA	20.55	3626 BRS	14.95
SB580	SMARTBOARD SYSTEM 72IN.	1/1/2002 00:00:00 R	1C551122381190	1 EA	1699	3626 BRS	82.4
SB580	SMARTBOARD SYSTEM 72IN.	1/1/2002 00:00:00 R	1C551122390880	1 EA	1699	3626 BRS	82.4
SB580	SMARTBOARD SYSTEM 72IN.	1/1/2002 00:00:00 R	1C551122470040	1 EA	1699	3626 BRS	82.4
SCOPESCOROTA	SURGICAL TELESCOPE	1/1/2002 00:00:00 R	1C551122470082	1 EA	1362	3626 BRS	66.06
SCOPESMURRAY	SURGICAL TELESCOPE	1/1/2002 00:00:00 R	1C551122470084	1 EA	787	3626 BRS	38.17
SG1/26	GRACEY CURETTE DOUBLED END 1/2	1/1/2003 00:00:00 R	1C551131642265	5 EA	12.62	3626 BRS	3.06
SG1/26	GRACEY CURETTE DOUBLED END 1/2	1/1/2003 00:00:00 R	1C551132092363	9 EA	12.62	3626 BRS	5.51
SG11/126	GRACEY CURETTE DBLE END 11/12	1/1/2003 00:00:00 R	1C551131642268	5 EA	12.62	3626 BRS	3.06
SG11/126	GRACEY CURETTE DBLE END 11/12	1/1/2003 00:00:00 R	1C551132092364	9 EA	12.62	3626 BRS	5.51
SG13/146	GRACEY CURETTE DBLE END 13/14	1/1/2003 00:00:00 R	1C551131642269	5 EA	12.62	3626 BRS	3.06
SG13/146	GRACEY CURETTE DBLE END 13/14	1/1/2003 00:00:00 R	1C551132092365	9 EA	12.62	3626 BRS	5.51
SG15/166	GRACEY CURETTE DBLE 15/16	1/1/2003 00:00:00 R	1C551131642270	5 EA	12.62	3626 BRS	3.06
SG15/166	GRACEY CURETTE DBLE 15/16	1/1/2003 00:00:00 R	1C551132092356	9 EA	12.62	3626 BRS	5.51
SS3C	SHARPENING STONE #3 MED GRIT	1/1/2003 00:00:00 R	1C551123441346	8 EA	13.14	3626 BRS	0
T05	TMS REFILL KIT MINIM 02IN	1/1/2003 00:00:00 R	1C551131502146	2 PG	67.54	3626 BRS	6.55

Appendix C Total Workload Data

FY03	Resource Sharing Visits	* Total APV's	Output Visits	Input Visits	Total Visits	** Radiology Raw Procedures	Radiology Weighted Procedures	** Lab Raw Procedures	Lab Weighted Procedures	** Pharmacy Prescriptions	Pharmacy Weighted Procedures	Disp
Oct-02	2,711	1,184	62,268	2,113	64,381	15,770	54,263	191,374	237,519	215,992	168,030	1,394
Nov-02	2,890	1,142	54,692	1,428	56,120	12,748	43,298	140,923	182,322	197,876	153,549	1,352
Dec-02	2,669	844	54,766	1,575	56,341	13,683	45,310	146,402	195,719	187,439	162,260	1,384
Jan-03	2,842	1,230	64,136	1,951	66,087	14,912	46,750	133,597	184,561	247,478	190,604	1,369
Feb-03	2,641	830	55,795	1,409	57,204	12,310	36,053	119,087	165,149	201,857	139,529	1,260
Mar-03	2,734	925	62,321	1,819	64,140	14,505	51,187	139,646	189,980	223,485	154,479	1,375
Apr-03	2,581	893	63,087	1,900	64,987	15,028	50,189	160,002	189,857	224,580	176,696	1,371
May-03	2,464	797	55,686	1,714	57,400	14,896	50,658	193,908	255,564	220,641	170,794	1,403
Jun-03	2,607	895	57,202	1,694	58,896	15,177	51,445	156,658	195,513	226,936	166,335	1,280
Jul-03	2,244	977	56,325	1,555	57,880	14,445	45,872	167,753	220,627	210,268	167,307	1,329
Aug-03	2,303	858	55,624	1,286	56,910	9,718	26,959	163,901	221,477	215,410	161,733	1,323
Sep-03	2,528	901	59,995	1,599	61,594	9,557	31,225	161,228	218,432	220,616	171,641	1,327
Total Average	31,214 2,601	11,476 956	701,897 58,491	20,043 1,670	721,940 60,162	162,749 13,552	533,209 44,434	1,874,479 156,207	2,456,720 204,727	2,592,578 216,048	1,982,957 165,246	16,167 1,347
Chg/mos % Change	225 10	43 5	4,371 8	313 24	4,684 8	-161 -2	4,266 16	-2,673 -2	-3,045 -1.4	5,206 2	9,908 6.13	4 0.3
Chg/YTD % Change	3,546 13	-1,217 -10	-88,857 -11	-5,123 -20	-93,980 -12	-2,632 -2	13,867 3	-934,877 -33	-591,585 -19	73,532 3	-90,346 -4	74 0

* Total APV's include OR/APV's

** Raw figures equal a one for one count for each procedure or test

*** Surgeries include OR/APV's

**** Anesthesia procedures are in addition to those performed as part of Surgery

NOTE: Ancillary raw and weighted figures may not match those reported in EAS IV. This is due to system problems with CHCS that are beyond our control. It was determined years ago to have this internal reporting mechanism reflect data actually occurring at WHMC and the numbers reported here could be manually adjusted.

Note: A blank cell reflects data not received at the time of EIC posting

Note: Pharmacy #'s (Raw and Weighted) for Feb F'03 are incorrect due to a CHCS system error. Numbers are from CHCS and not manually corrected. Dental figures will not be available until after the 20th of the month

Adm	Occupied Bed Days	ALOS	ADPL	Live Births	OR/APVs	*** Surgeries	**** Anesthesia Procedures	Observation	Dental	DWVs	Immunizations
1,385	5,648	4.1	182	163	529	823	792	29	18,353.25		56,030
1,333	5,303	3.9	177	177	539	828	612	36	18,527.21		40,241
1,390	5,584	4.0	180	166	418	752	534	20	18,650.90		39,203
1,389	5,699	4.2	184	162	486	886	703	19	17,719.41		39,084
1,229	4,986	4.0	178	149	461	756	616	16	19,895.17		34,865
1,408	5,416	3.9	175	192	470	796	719	13	18,950.50		33,799
1,372	5,465	4.0	182	170	501	881	757	19	21,560.53		27,582
1,381	5,637	4.0	182	173	419	752	665	18	16,339.01		33,312
1,290	5,266	4.1	176	172	511	836	690	11	20,022.14		29,725
1,345	5,631	4.2	182	200	525	840	796	19	18,363.14		26,694
1,293	5,254	4.0	169	163	444	775	668	19	20,087.82		33,201
1,349	5,305	4.0	177	200	447	757	766	22	17,773.86		27,775
16,164	65,194			2,143	2,087	5,750	9,682	8,318	241	226,242.94	421,511
1,347	5,433	4.0	179	174	479	807	693	20	18,854		35,126
56	51	-0.26	-19.00	37	3	-18	98	3	-2,314	-5,426	
4.3	1	0.7	4.3	23	1	-2	15	16	.11.5	.16	
16	327	1	0.0	9	136	383	317	-672	-325	-7,921	106,898
0				0	7	7	3	-7	-57	-3.4	34

* Total APV's include OR/APV's

** Raw figures equal a one for one count for each procedure or test

*** Surgeries include OR/APVs

**** Anesthesia procedures are in addition to those performed as part of Surgery

NOTE: Ancillary raw and weighted figures may not match those reported in EAS IV. This is due to system problems with CHCS that are beyond our control. It was determined years ago to have this internal reporting mechanism reflect data actually occurring at WHMC and the numbers reported here could be manually adjusted.

Note: A blank cell reflects data not received at the time of EIC posting

Note: Pharmacy #'s (Raw and Weighted) for Feb FY03 are incorrect due to a CHCS system error. Numbers are from CHCS and not manually corrected.

Dental figures will not be available until after the 20th of the month